Conspectus of the Families, Genera and Species of Cephalopoda, included in this paper.

In the following synopsis the species that have actually been proved to belong to the fauna of the northeastern coast of America, or the waters adjacent, are numbered serially. They have all been personally studied by me, except *Taonius pavo.*

SUBCLASS DIBRANCHIATA.

Cryptodibranchiata Blainville, Dict. Sci. Nat., vol. xxxii, p. 172, 1824.
Acétabulifères Férus. & D'Orb., 1835; Céphal. Acétab., pp. v, xxxv, 1.
D'Orbigny, Hist. Cuba, Moll., p. 5, 1853.
Dibranchiata Owen, Trans. Zool. Soc. London, vol. ii, p. 103, 1838.
Antepedia Gray, Catal. Brit. Mus., Moll., vol. i, p. 3, 1849.

Branchial cavity large, containing a single pair of large, highly specialized gills, each having a muscular branchial heart at its base. Mantle very muscular. Siphon completely tubular, with or without an internal valve, and used in locomotion. The interior lateral or basal lobes of the siphon are flexible, and capable of acting as valves to close the opening of the branchial sac by pressing against the inside of the mantle when it contracts. The jet of water, thus forced through the siphon, by its reaction propels the animal backward or forward, or in any direction opposite to that in which its flexible extremity may be turned.

The body varies in form from subspherical to long-conical; sides often with fins. Mantle destitute of an external shell. The internal shell, when present, is dorsal, and may be either horny or calcareous. Sessile arms in four pairs, around the head, provided, on the inner surface, with suckers or with hooks (modified suckers). Eyes highly developed. Mouth with a sharp, horny beak, the upper jaw shutting into the lower one; mandibles hollow, supported by strong internal cartilages. Odontophore with seven (or rarely five) rows of sharp teeth. An ink-sac, which opens near the end of the intestine, at the base of the siphon.

This subclass includes two very natural divisions:

Decacera.—Having, inside the circle of eight sessile arms, two long tentacular arms, with suckers or hooks on the distal portion. Suckers

pediceled, with horny rims. Body usually elongated, always with lateral fins.*

Octopoda.—Having only the eight sessile arms. Suckers not pediceled, destitute of horny rings. Body usually short, obtuse, rarely finned.

Order I.—DECACERA.

Decapoda Leach, Zool. Miscel., vol. iii, 1817 (t. Gray) [*non* Latr., 1806].
H. & A. Adams, Genera, vol. i, p. 25.
D'Orbigny, Tabl. Méth. des Cephal., p. 57, 1826; Hist. Cuba, Moll., p. 30, 1853.
Decacera Blainville, Dict. Sci. Nat., vol. xxii, 1824: Man. Mal., p. 366, 1825.
Sephinia Gray, Catal. Brit. Mus., Moll., vol. i, p. 35, 1849.

Body generally rounded and elongated, often acute posteriorly. Ten prehensile arms, bearing suckers or hooks, which are *pediceled.* Four pairs of these, called sessile arms, are tapered from the base and covered with rows of suckers along the whole length of the inner face; the fifth pair of arms, known as tentacular arms, differ from the rest, and arise from a pair of pits or pouches, situated between and inside the bases of the third and fourth pairs of sessile arms; they have a more or less slender and contractile peduncular portion and a distal, usually enlarged, sucker-bearing portion. Beak protractile, surrounded by an inner, and a loose outer buccal membrane, the latter usually with seven or eight angles, united to the arms by membranes. Eyes movable in the sockets, with or without lids. Head united to the mantle either by a dorsal commissure and two lateral, free, connective cartilages; by three free connective cartilages; or by three muscular commissures. Mantle usually supported by an internal, dorsal, horny 'pen,' or by a calcareous, internal, dorsal shell or 'bone;' sometimes the pen is absent; always with muscular fins on each side. Male, when adult, usually with one or two of the arms hectocotylized.

This group was divided by D'Orbigny into the following two tribes, which are more convenient than natural:

Oigopsidæ.—Eyes naked in front, furnished with free lids, with or without an anterior sinus; pupils round.

Myopsidæ.—Eyes usually covered by transparent skin, sometimes with a thickened fold, forming a lower lid, but in *Stoloteuthis* the lids are entirely free; pupils crescent-shaped, rarely round.

* The name *Decacera*, though not in so general use as *Decapoda* for this group, is retained because the latter was previously, and still is, in use for a group of Crustacea, and, therefore, cannot properly be used for these Cephalopoda.

OIGOPSIDÆ.

The division called *Oigopsidæ* includes two very diverse groups, differing very widely in their visceral anatomy, as well as in the structure of the eyes, siphon, and mantle connections. These may be called *Teuthidea* and *Taonidea.*

The former will include all the Oigopsidæ described in this paper except the *Desmoteuthidæ.* The *Taonidea* will include our *Desmoteuthidæ*, and also several allied forms, which have usually been carelessly referred to *Loligopsis.*

TEUTHIDEA Verrill.

Eyes with free lids, not stalked. Siphon with a subterminal valve. Mantle attached to the siphon by free connective cartilages. Stomach large, pouch-like; intestine short; liver very large; ink-sacs large. Pen horny, well developed, as long as the mantle. One of the ventral arms is usually hectocotylized in the male. Arms with suckers, or with claws, or with both.

Family TEUTHIDÆ Owen (restricted.)

Teuthidæ (pars) Owen, Trans. Zool. Soc. London, vol. ii, 1838.

Teuthidæ (pars) D'Orbigny, Céphal. Acétab., p. xxxvii (Introduction), p. 328, 1835–1848.

Onychoteuthidæ (pars) Gray, Catal. Brit. Mus., Moll., vol. i, p. 45, 1849.
H. & A. Adams, Genera, vol. i, p. 30.

Tentacular arms furnished with sharp, horny claws or hooks, which correspond with peculiarly and highly modified sucker-rings; true denticulated suckers usually accompany the hooks; tip of arm with a cluster of small suckers; proximal part of club usually with a mixed group of connective tubercles and smooth-rimmed suckers, by which the arms can be fastened together and used in concert. Sessile arms with hooks, with suckers, or with both. Eyes with free lids and a sinus. Mantle united to neck by three simple, movable, connective cartilages. Siphon with a valve and with dorsal bridles. Nuchal or olfactory crests well developed. Pen thin, usually lanceolate, generally with a posterior hooded portion, or hollow cone, and sometimes terminated by a solid cartilaginous cone. Hectocotylized arm not observed.

For a brief synopsis of the previously known genera of this family,* see pp. 250, 251.

Owen's family, *Teuthidæ*, included nearly all the *Decacera* having horny internal shells. As adopted by D'Orbigny, it included our *Ommastrephidæ* and *Teuthidæ*.

Enoploteuthis (See pp. 251, 404).

Enoploteuthis Hartingii Verrill. (pp. 240, 241, 404).

Enoploteuthis Molinæ D'Orb.=**E. Cookii** Owen. (pp. 241, 404).

Moroteuthis Verrill. (See p. 393).

Moroteuthis robusta (Dall) Verrill. (pp. 246, 393).

Gonatus Gray. (See pp. 290, 387, 390).

Gonatus amœnus Gray. (pp. 291, 388, 390).

Lestoteuthis Verrill. (See pp. 250, 387, 390).

1. Lestoteuthis Fabricii (Licht.) Verrill (pp. 291, 293, 387–390).

Family OMMASTREPHIDÆ.

Teuthidæ (*pars*) D'Orbig., Céphal. Acétab., pp. xxxvii, 328.
Onychoteuthidæ (*pars*) Gray, Catal. Brit. Mus., Moll., vol. i, p. 45, 1849.
Ommastrephidæ Gill, Classification Mollusca, p. 1, 1871.
Tryon, Man. Conch., vol. i, p. 107, 1879.

Body elongated, often very large (*Architeuthis*), tapering to a point posteriorly, shorter and less acute in the female. Sessile and tentacular arms without hooks, but provided with suckers, having denticulated, horny rings; tentacular arms with an expanded club, having four rows of suckers on its middle portion, those in the two central rows larger; proximal portion with or without smooth-rimmed connective suckers and tubercles; tip with a cluster of smooth-rimmed suckers. Siphon in a deep groove, attached by four bridles; an internal valve. Eye-lids with a distinct anterior sinus. Nuchal and olfactory crests consist of three longitudinal membranes on each side, united by a transverse one in front. Connective cartilages of the mantle

* The genus *Dosidicus* Steenst., should not have been there included. It belongs to the *Ommastrephidæ*, and is very closely related to *Sthenoteuthis*. The tentacular club bears denticulated suckers and the terminal cone of the pen is hollow.

Ancistroteuthis Krohnii appears to belong to *Onychoteuthis*. *Gonatus* and *Lestoteuthis* have since been restricted and their characters revised. (See pp. 388–394).

three; the lateral ones are usually T-shaped, formed by a longitudinal ridge, with a smaller transverse one across its posterior end; the corresponding cartilages on the siphon are long-triangular, with a longitudinal and a transverse groove. Two oviducts. Hectocotylized arm of the male may be either the right or left ventral.

Pen usually very narrow along the middle portion, and with three ribs; anterior and posterior portions expanded, the latter with the edges involute, and forming a terminal hood or hollow cone.

Ommastrephes (See pp. 267, 385).

Ommastrephes (*pars*) D'Orbigny, Voy. Am. Mérid., 1835; Céphal. Acétab., p. 341.
Illex and *Todarodes* Steenstrup, Oversigt k. Danske Videnske. Selsk. Forhand., 1880, p. 90.

2. Ommastrephes illecebrosus (Les.) Verrill. (pp. 268, 403).

Sthenoteuthis Verrill. (See pp. 222, 286, 385, 402).

Ommastrephes (*pars*) D'Orbigny, Voy. Amér. Mérid., Moll., (1835?); Céphal. Acétab., 1839–'48.
Sthenoteuthis Verrill, Trans. Conn. Acad., vol. v, p. 222, Feb., 1880; Amer. Journ. Sci., vol. xix, p. 289, April, 1880.
Ommastrephes Steenstrup, Oversigt k. Danske Vidensk. Selsk. Forhandl., 1880, p. 89 (sep. cop. p. 19, received Aug., 1880).

3. Sthenoteuthis megaptera Verrill. (pp. 223, 286).

Sthenoteuthis pteropus (Steenst.) Verrill. (pp. 228, 402).

4. Sthenoteuthis Bartramii (Les.) Verrill. (p. 288).

Architeuthis (Steenst.) Harting, 1881. (See pp. 197, 259, 394, 422).

Architeuthus Steenst., 1856, (no description).

5. Architeuthis Harveyi Verrill. (pp. 177–210, 259, 395, 422).

6. Architeuthis princeps Verrill. (pp. 181–189, 194, 259).

Architeuthis monachus (Steenst.) (pp. 238–245).

Architeuthis dux (Steenst.) Gervais. (pp. 238–240).

Architeuthis Hartingii Verrill. (p. 240).

Architeuthis Bouyeri Verrill. (p. 243).

Architeuthis (?) Mouchezi Vélain. (pp. 243, 398).

Architeuthis grandis (Owen) Verrill. (p. 400).

The number of the foreign species, mostly nominal and imperfectly known, will undoubtedly be much reduced when they become better known. Probably *A. dux* and *A. Bouyeri* are identical, but there is as yet no proper zoological description of either. The former has been very briefly described by Gervais, and Harting has published an outline figure of one of the mandibles.

Family MASTIGOTEUTHIDÆ, nov.

Body slender, pointed behind. Caudal fin large, rhombic. Mantle united to neck by three movable cartilages. Siphon with an internal valve and one pair of dorsal bridles. Eyes large, not prominent; lids free, simple. Buccal membrane 6-angled, without suckers. Arms free; suckers in two rows. Tentacular arms (in the typical species) not expanded into a club, the terminal portion round, tapering, covered with a multitude of minute suckers, in many rows. Neither auditory nor olfactory crests. Pen narrow, with a long, hollow posterior cone.

This family differs from *Ommastrephidæ* in lacking a distinct lachrymal sinus and olfactory frills, in the remarkable character of the tentacular arms, and in the simple connective cartilages.

Mastigoteuthis Verrill. (See p. 296).

7. **Mastigoteuthis Agassizii** Verrill. (p. 297).

Family CHIROTEUTHIDÆ Gray, (restricted).

Loligopsidæ (*pars*) D'Orb., Céphal. Acétab., p. 320, 1835–48.
Chiroteuthidæ (*pars*) Gray, Brit. Mus. Catal., Moll., vol. i, p. 42, 1849.

Body small; mantle with three movable connective cartilages. Eyes not prominent, with free, simple lids; no sinus. Siphon small, with an internal valve; no dorsal bridle. Olfactory crests absent. Buccal membrane seven-angled, without suckers. Buccal aquiferous openings six. Sessile arms large; web rudimentary; suckers with toothed horny rings, encircled by a groove. Tentacular arms very long and slender, with a large club; tip often with a spoon-shaped organ, opening backward; peduncle with sessile connective suckers; club with rows of singular small suckers, having a swollen bulb on the long pedicel. Pen with a long, narrow shaft, posterior portion involute, tubular.

It is somewhat doubtful whether *Calliteuthis* belongs to this family, its tentacular arms being unknown.

Chiroteuthis D'Orb. (See p. 299).

Chiroteuthis is the only genus in this family that has been hitherto recognized.

8. Chiroteuthis lacertosa Verrill. (pp. 299, 408).

Brachioteuthis Verrill. (See p. 405).

9. Brachioteuthis Beanii Verrill. (p. 406).

Calliteuthis Verrill. (p. 295).

10. Calliteuthis reversa Verrill. (p. 295).

Calliteuthis ocellata (Owen) Verrill. (p. 402).

Family HISTIOTEUTHIDÆ, nov.

Loligopsidæ (*pars*) D'Orbig., Céphal. Acétab., p. 320, 1835–48.
Chiroteuthidæ (*pars*) Gray, Catal. Brit. Mus., Moll., vol. i, p. 42, 1849.

Body small, short, with small caudal fins. Mantle united to the neck by three movable cartilages. Siphon with neither dorsal bridle nor internal valve (?).* Head large. Olfactory crests absent. Eyes large, not prominent; lids free and simple; no sinus. Buccal membrane with six smooth lobes; buccal aquiferous openings four. Nine brachial openings at the bases of the tentacular arms. Six upper arms usually united by a very broad web; sucker-rings convex, with small, oblique apertures. Tentacular arms moderate, with a well-developed club, bearing large, normal, central suckers, and small marginal ones; proximal part of the club with connective suckers and tubercles. Pen broad, short, lanceolate, much like that of *Loligo*.

Histioteuthis D'Orbigny. (See p. 233).

11. Histioteuthis Collinsii Verrill. (pp. 234, 300, 404).

TAONIDEA Verrill.

Eyes large, stalked or prominent, having free lids, but no sinus. Mantle united to base of siphon and back of neck by three muscular commissures. Siphon large, without a true subterminal valve, but usually with special elevated processes, or flaps, in the basal portion. Stomach small, far back; intestine very long, covered with lateral

* According to D'Orbigny there is no valve in this genus, nor in *Chiroteuthis*, but in the latter there is certainly a valve, and it may have been overlooked by him, also, in the former. My specimens lack the siphon.

follicular glands; liver small, far forward; ink-sac small. Pen slender anteriorly, as long as the mantle. Hectocotylized arm not observed. All the arms bear suckers.

Family DESMOTEUTHIDÆ Verrill. (See p. 300).

Body much elongated, mantle united to the neck by three muscular commissures. Siphon without a true valve, but with three peculiar, special thickenings, or raised processes* in its basal portion. Eyes prominent. Intestine very long; ink-sac small.

Desmoteuthis Verrill. (See p. 300).

12. **Desmoteuthis hyperboreus** (Steenst.) Verrill. (p. 302).

13. **Desmoteuthis tenera** Verrill. (p. 412).

Taonius Steenstrup, restricted. (See p. 306).

14. **Taonius pavo** (Les.) Steenstrup. (See p. 306).

MYOPSIDÆ D'Orbigny.

Eyes usually without regular lids; the integument of the head sometimes becomes transparent and extends continuously over the eye; in some genera (*Rossia*, &c.) there is a fold of skin below the eye, constituting a free lower eyelid, while the upper lid is adherent to the eye-ball; but in *Stoloteuthis* the lids are entirely free. The pupil is usually crescent-shaped, or indented on the upper side, but is round in *Stoloteuthis*. Sometimes a small pore in front of the anterior edge of the eye connects with the orbital cavity. Siphon usually with a valve.

This artificial division includes two very diverse groups, which not only differ widely in the condition of the eyes, but also in the nature of the hectocotylization of the arms, and in anatomical characters.

To one of these groups, containing the family *Sepiolidæ*, I propose to apply the name *Sepiolidea*.

The other division, *Sepidea*, includes the families, *Sepidæ*, *Loliginidæ*, *Idiosepidæ*, and perhaps *Spirulidæ;* but the latter might, perhaps, be best placed with fossil forms in a division of which it is the sole surviving genus.

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* Of these organs the median dorsal one is larger and more complicated than the others (see Pl. LV, fig. 2*d*. *m*; and fig. 4*a*). It seems to me probable that this organ is a true homologue of the foot of gastropods.

SEPIDEA Verrill.

The integument extends entirely over the eye and there is a pore in front of it. Pupil crescent-shaped. Body commonly elongated. Pen various, rarely absent, usually large, broad-lanceolate or ovate, either horny or calcareous (spirally coiled, tubular and chambered in *Spirula*, in which it is posteriorly situated.) One of the ventral arms of the male is usually hectocotylized.

Mantle usually with three connective cartilages, rarely with one (dorsal) or three muscular commissures.

Family LOLIGINIDÆ.

Teuthidæ (*pars*) Owen, Proc. Zool. Soc. London, p. 285, 1847.
Loligidæ D'Orbigny, Céph. Acétab., p. 297, 1848.
Loligidæ (*pars*) Gray, Catal. Moll. Brit. Mus., vol. i, p. 66, 1849.
Loliginidæ (*pars*) H. & A. Adams, Genera Moll., vol. i, p. 35.

Body more or less elongated, cylindro-conical. Fins elongated, united and acute posteriorly, sometimes extending the whole length of the body. Pen large, extending the whole length of the mantle, with an acute, short, pen-like anterior shaft, and a broader, thin, lanceolate blade. Connective cartilages of the mantle three, movable. Eyes without a thickened false lid. Siphon provided with an internal valve, and usually with a dorsal bridle. Olfactory crests, about the ears, well-developed. Tentacular club large, with four rows of denticulated suckers on the middle portion. Horny rings of the suckers encircled externally by a raised median ridge.

Loligo Lamarck. (See p. 307).

15. Loligo Pealei Les. (p. 308).

16. Loligo (Lolliguncula) brevis Blainv.* (p. 343).

Sepioteuthis D'Orbig. (See p. 346).

Sepioteuthis sepioidea D'Orb. (p. 345).

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* Professor Steenstrup, in a recent paper (Sepiadarium og Idiosepius.<Vid. Selsk. Skr., 6 R., 1, 3, p. 242, note, 1881), has proposed to make this species the type of a new genus, *Lolliguncula*, because the female receives the spermatophores on the inner surface of the mantle,—a character that seems to be scarcely of generic value, unless it be reinforced by anatomical differences now unknown. Such characters may possibly exist in the unknown males.

SEPIOLIDEA Verrill.

In this group the eye-lids are either entirely free all around, or the upper one may be attached to the eye-ball. Pupil either round or crescent-shaped. Body short, obtuse. Fins lateral, separated. Pen small or rudimentary, sometimes absent. Sucker-rings smooth. Dorsal arms of the male are usually hectocotylized, one or both.

Family SEPIOLIDÆ. (See pp. 347, 416).

Stoloteuthis Verrill. (See pp. 347, 417).

17. Stoloteuthis leucoptera Verrill. (pp. 347, 418).

Inioteuthis Japonica (D'Orb., sp. ?) Verrill. (p. 417).

Inioteuthis Morsei Verrill, sp. nov. (p. 417).

Rossia Owen. (See p. 349).

18. Rossia megaptera V. (p. 349).

19. Rossia Hyatti V. (p. 351).

20. Rossia sublevis V. (pp. 354, 419).

Heteroteuthis Gray. (See p. 357).

21. Heteroteuthis tenera V. (pp. 357, 419).

OCTOPODA Leach. (See p. 360).

Family PHILONEXIDÆ D'Orb. (See p. 361).

Parasira Steenst. (See p. 361).

Vidensk. meddel. naturh. Forening, Kjöbenhavn, 1860, p. 333.

22. Parasira catenulata Steenst. (p. 362).

Family ARGONAUTIDÆ Cantr. (See p. 364).

Argonauta Linné.

23. Argonauta argo Linné. (pp. 364, 420).

Family ALLOPOSIDÆ Verrill. (See p. 365).

Alloposus Verrill. (See p. 365).

24. Alloposus mollis Verrill. (pp. 366, 420).

Family OCTOPODIDÆ D'Orb. (See p. 367).

Octopus Lam. (See p. 367).

25. Octopus Bairdii Verrill. (pp. 368, 421).

26. Octopus lentus Verrill. (p. 375).

27. Octopus piscatorum Verrill. (p. 377).

28. Octopus obesus Verrill. (p. 379.)

Octopus rugosus Bosc. (p. 368).

Octopus vulgaris. (p. 252).

Octopus punctatus Gabb. (p. 252).

Eledone Leach. (p. 380).

29. Eledone verrucosa Verrill. (p. 380).

Family CIRRHOTEUTHIDÆ Keff. (See p. 382).

Stauroteuthis Verrill. (p. 382).

30. Stauroteuthis syrtensis Verrill. (p. 382).